

THE CLAIMS

What is claimed is:

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1. A method of forming a doped A site deficient thin film manganate material on a substrate from corresponding precursor(s), comprising liquid delivery and flash vaporization thereof to yield a precursor vapor, and transporting the precursor vapor to a chemical vapor deposition reactor for chemical vapor deposition formation of the thin film manganate material on the substrate.

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2. A method according to claim 1, wherein the precursor(s) comprise coordination compounds, or Lewis base complexes of the same, of metal(s) selected from the group consisting of lanthanum, magnesium, calcium, strontium, barium, and manganese.

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3. A method according to claim 1, wherein the precursor(s) include metal β -diketonate compounds, metal pivalate compounds, or Lewis base complexes thereof.

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4. A method according to claim 1, wherein the precursor(s) include metal fluorinated β -diketonate compounds, or Lewis base complexes thereof.

5. A method according to claim 1, wherein the precursor(s) include metal pivalate Lewis base adducts.

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6. A method according to claim 1, wherein the thin film manganate material is selected from the group consisting of LaMgMnO , LaCaMnO , LaSrMnO , and LaBaMnO .

7. A method according to claim 1, wherein the precursor(s) are dissolved in a solvent and flash vaporized at a temperature of from about 100 °C to about 300 °C.

8. A method according to claim 1, wherein the precursor vapor is transported to the
5 chemical vapor deposition reactor in a carrier gas.

9. A method according to claim 8, wherein the carrier gas is selected from the group consisting of argon, nitrogen, neon, helium and ammonia.

10. A method according to claim 8, wherein the carrier gas is mixed with an oxidizing co-reactant gas in the chemical vapor deposition reactor or prior to transport to the chemical vapor deposition reactor.

11. A method according to claim 1, wherein the chemical vapor deposition reactor contains a
15 substrate article heated to a temperature in the range of from about 300 °C to about 1000 °C.

12. A method according to claim 11, wherein the pressure of the precursor vapor in the chemical vapor deposition reactor is from about 0.1 to about 760 torr.

20 13. A method according to claim 1, wherein the chemical vapor deposition is plasma-assisted.

14. A method according to claim 1, wherein the precursor(s) comprise a β -diketonate ligand selected from the group consisting of $\text{La}(\text{thd})_3$, $\text{Ca}(\text{thd})_2$ and $\text{Mn}(\text{thd})_3$.

25 15. A method according to claim 14, wherein the precursor(s) comprise a mixture of β -diketonate ligands selected from the group consisting of $\text{La}(\text{thd})_3$, $\text{Sr}(\text{thd})_2$ and $\text{Mn}(\text{thd})_3$.

16. A method according to claim 14, wherein said precursor(s) comprise a mixture of Lewis base adducts of metal β -diketonate precursors.

17. A method according to claim 1, wherein said thin film manganate material has A-site deficient stoichiometry, where $(La+Ca) < 1.0$.

18. A method according to claim 1, wherein said thin film manganate material has A-site deficient stoichiometry, where $0.5 < (La+Ca) < 0.99$.

19. A method according to claim 1, wherein said thin film manganate material has A-site deficient stoichiometry, where $(La + Sr) < 1.0$.

20. A method according to claim 1, wherein said thin film manganate material has A-site deficient stoichiometry, where $0.5 < (La + Sr) < 0.99$.

21. A method according to claim 1, wherein said thin film manganate material has A-site deficient stoichiometry, where $(La + Ba) < 1.0$.

22. A method according to claim 1, wherein said thin film manganate material has A-site deficient stoichiometry, where $0.5 < (La + Ba) < 0.99$.

23. A device comprising a manganate layer on a substrate, wherein said manganate layer is formed on the substrate by a process including: providing corresponding precursor(s) for said manganate layer, transporting said precursor(s) by liquid delivery and flash vaporization thereof to yield a precursor vapor, and transporting the precursor vapor to a chemical vapor deposition reactor for formation of an A-site deficient thin film manganate material on the substrate.

24. A thin film manganate material of the formula $\text{La}_x \text{M}_y \text{MnO}_3$, where $\text{M} = \text{Mg}, \text{Ca}, \text{Sr}, \text{or Ba}$, and $(x + y) < 1.0$.

25. A thin film manganate material of the formula $\text{La}_x \text{M}_y \text{MnO}_3$, where $\text{M} = \text{Mg}, \text{Ca}, \text{Sr}, \text{or Ba}$, and $0.5 < (x + y) < 0.99$.

26. A device comprising a thin film manganate material of the formula $\text{La}_x \text{M}_y \text{MnO}_3$, where $\text{M} = \text{Mg}, \text{Ca}, \text{Sr}, \text{or Ba}$, and $(x + y) < 1.0$.

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